BI TSIN-KHUA [Pi Ch'ing-hua]; KORNILOV, I.I.

Phase equilibrium diagram for the system titanium - vanadium - iron. Trudy Inst. met. no.8:54-57 '61. (MIRA 14:10)
(Titanium-vanadium-iron alloys--Metallography)
(Phase rule and equilibrium)

KORNILOV, I.I.; MATVEYEVA, N.M.

Vanadium and its fields of application. Trudy Inst. met. no.8: 58-81 '61. (MIRA 14:10)

(Vanadium)

KORNILOV, I.I.; NARTOVA, T.T.

Dependence of the creep of alloys in the binary system titanium - tin on their composition. Trudy Inst. met. no.8:107-110 '61. (MIRA 14:10)
(Titanium-tin alloys—Metallography)
(Creep of metals)
(Phase rule and equilibrium)

18.9200 1454, 1418, 1045

S/078/61/006/006/005/013
B110/B206

AUTHORS: Pi Ch'ing-hua, Kornilov, I. I.

TITLE: Phase diagram of the ternary system Ti - V - TiFe

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 6, 1961, 1351-1354

TEXT: From the investigation results of quasi-binary sections $TiFe_2$ - V and TiFe - V, the authors established for the phase regions of the ternary system Ti - V - TiFe that at room temperature four monophase, five diphase, and two triphase regions are in a state of mutual equilibrium. It was the authors' aim to study the phase diagrams of this system at 1000 and 800°C, as well as the phase conversions of some alloys in the solid state. 93 alloys from titanium sponge TG-O (TG-O), metallic vanadium (99% V), and an alloy corresponding to the compound TiFe with a ratio Ti : Fe = 50 : 50; 60:40; 70:30; 80:20; 84:16; 90:10 and 95:5 were produced and investigated by microstructure- and X-ray structural analysis. For the structural analysis these alloys were quenched in water after 48 hr heating at 1000°C and 248 hr at 800°C. The alloy with 2.5% V and 4.0% Fe was in the diphase

Card 1/6

Phase diagram of the ternary system ...

= 84 : 16 and variable V content, on the basis of which the polythermal curve (Fig. 4) was built. It can be seen from it that the phase conversions change over for 5% V from the $\alpha+\beta+\gamma$ -regions into the $\alpha+\beta+\gamma+\delta$-region at 600°C at relatively low temperatures, for 10% V from the $\alpha+\gamma+\delta$ -region into the $\alpha+\gamma$-region at 505°C. With an increase of the V content above 40%, the temperature of the conversion of the $\beta+\gamma$-phase into the solid β-solution drops. In all phase conversions from triphase regions ($\alpha+\beta+\gamma$ or $\alpha+\gamma+\delta$) into diphase regions, heat is set free, which determines the conversion temperature. There are 4 figures, 1 table, and 5 references: 4 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-language publication reads as follows: W. R. Lucas, W. P. Fizhel. Trans.Amer. Soc. Metals, 46, 277 (1954).

ASSOCIATION: Institut metallurgii Akademii nauk SSSR im. A. A. Baykova
(Metallurgical Institute imeni A. A. Baykov, AS USSR)

SUBMITTED: April 30, 1960

Card 3/6

89362

S/089/61/010/002/013/018
B102/B209

18.1152

AUTHORS: Kornilov, I. I., Polyakova, R. S.

TITLE: Hardness of some alloys on niobium basis at high temperatures

PERIODICAL: Atomnaya energiya, v. 10, n. 2, 1961, 170-172

TEXT: The present "Letter to the Editor" describes investigations of the temperature dependence of the hardness of niobium and of some of its alloys, which were carried out after a method described in Ref. 1. The alloys examined had the following composition (in % by weight):

Nb	Mo	Zr	Si	Al	C
100	-	-	-	-	-
95	5	-	-	-	-
90	5	5	-	-	-
89	5	5	1	-	-
88	5	5	1	1	-
87,8	5	5	1	1	0,2

Card 1/3

the investigations: 1) Niobium, just as nickel, iron, or cobalt may be strengthened by alloying it; the components may be introduced either by formation of a solid solution or by formation of a supersaturated solid solution and separation of the excess phase. 2) The method of the "hot" hardness (which was used here) allows to characterize in first approximation the hardness of alloys at high temperatures. 3) Multi-component alloys showing high hardness at 1000°C have to be further examined and to be tested for heat resistance by means of standard methods. There are 3 figures, 1 table, and 3 references: 3 Soviet-bloc.

SUBMITTED: June 18, 1960

Legend to Fig. 2: Ordinate: Hardness (kg/mm^2); abscissa: Temperature (°C). The figures beside the curves indicate the number of components (cf. Table).
Legend to Fig. 3: Strengthening coefficient of the alloys at three different temperatures; the figures n denote the (n+1)-component alloy.

18.1285

31052
S/126/61/012/004/008/021
E193/E383

AUTHORS: Kornilov, I.I. and Yakimova, A.M.

TITLE: The effect of hydrogen on the structural properties of alloys T3, T4, T6 and T8

PERIODICAL: Fizika metallov i metallovedeniye, v. 12, no. 4, 1961, 550 - 557

TEXT: The alloys T3, T4, T6 and T8 represent a group of alloys of the six-component Ti-Al-Cr-Si-Fe-B system, differing in the Al content only, the total content of the remaining alloying additions being constant at 1.2 - 1.6%. The Al content of the experimental alloys was 3% (T3), 4.26% (T4), 6.08% (T6) and 7.37% (T8), their oxygen and nitrogen content being 0.09% and 0.03%, respectively. Hydrogen (0.005, 0.015, 0.025, 0.05 or 0.08%) was introduced by heating in vacuum at 700 °C in the presence of titanium hydride. The effect of hydrogen was studied by metallographic examination, mechanical testing and X-ray diffraction. Tensile tests were carried out at room temperature at strain rates of 0.16, 11.3 and 48.2 mm/min. The impact strength was determined at +20 and -78 °C. Thermal

Card 1/14

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E193/E383

The effect of hydrogen on ...

stability (resistance to oxidation) was studied by holding the alloys for 100 hours at 450 and 500 (T5 and T4) or 500 and 550 °C (T6 and T8) and subjecting them to tensile tests at room temperature. Several conclusions were reached. 1) Addition of up to 0.25% hydrogen slightly increases the room-temperature tensile strength of the alloys studied without significantly affecting their plasticity with the exception of the alloy T8. This is illustrated in Fig. 2, where reduction of area (ψ, %, vertical scale) is plotted against the hydrogen content (%) and strain rate (v, mm/min) used during the tensile test. These results were attributed to the fact that the l a t t i c e of the α-phase was only slightly distorted by hydrogen owing to its small atomic radius. The loss of ductility in alloy T8 is most likely associated with the precipitation of brittle α_2-phase. 2) The impact strength of alloys T4, T6 and T8 at room and sub-zero temperatures is not affected by the variation of the hydrogen content in the 0.005 - 0.08% range. Alloy T3 is an exception because of low

Card 2/7 4

The effect of hydrogen on ...

solubility of hydrogen in alloys with 3% Al. In the case of this alloy, the impact strength at room temperature falls from 4 kgm/cm^2 at 0.005% hydrogen to 1.0 kgm/cm^2 at 0.08%, the corresponding decrease in the impact strength at -78 °C being from 3.2 to 0.8 kgm/cm^2. 3) Thermal stability of the alloy T8 is strongly affected by the variation of its hydrogen content which, however, does not affect this property in the case of alloys T3, T4 and T6. This is indicated by data given in Table 3, showing the various mechanical properties of the alloys studied after preliminary treatment consisting of heating in air at various temperatures for various times. 4) X-ray - diffraction analysis revealed the presence of a residual β-phase in the alloys studied. The α- and β-phases are not in equilibrium and a transformation takes place when these alloys are held for 100 hours at 450 - 550 °C, as a result of which the state of equilibrium is reached. This transformation is accompanied by redistribution of the alloying elements between the α- and β-phases, the β-phase becoming enriched with Cr and Fe.

Card 3/4

5) The lattice parameter of the β-phase in the alloys T3 and T4 is unaffected by the presence of hydrogen. In the case of alloys T6 and T8, hydrogen dissolving in the β-phase on heating considerably increases its lattice parameter.

Acknowledgments are expressed to N.I. Blok, A.I. Glazova and N.F. Lashko. There are 5 figures, 3 tables and 7 references: 5 Soviet-bloc and 2 non-Soviet-bloc.

SUBMITTED: February 14, 1961

Card 4/4

18.1285 also 1555

21568
S/020/61/137/003/018/030
B103/B208

AUTHORS: Grum-Grzhimaylo, N. V., Kornilov, I. I., Pylayeva, Ye. N., and Volkova, M. A.

TITLE: Metallic compounds in the range of solid α-solutions of the system titanium-aluminum

PERIODICAL: Doklady Akademii nauk SSSR, v. 137, no. 3, 1961, 599-602

TEXT: The authors proved (Ref. 6: Tr. inst. metallurgii AN SSSR, no. 2, 1957) that in titanium - aluminum alloys (7.5-20 wt% Al) the resistance to creeping in bending deformation by the centrifugal method rapidly increases as plasticity decreases. They point out that such a change of properties in the range of solid solutions of the binary system Ti - Al could not be explained by conventional methods of metallographic analysis. The objectives of the present study were therefore the following: 1) investigation of the range of solid α-solution in the Ti - Al system; 2) determination of the nature of phases appearing in it by measuring the Hall effect as a function of the composition of the alloys. The authors have previously proved (Ref. 9: ZhNKh, 2, no. 10, 1957; Ref. 10: ibid,

Card 1/8

Metallic compounds in the range of ...

31, no. 9, 1956) that the galvanomagnetic effects are related to the composition of various alloys in a way that salient points and jumps appear in the diagram composition-versus-Hall effect. This phenomenon can be explained by the fact that the electron states in the outer atomic shells are changed by applying a magnetic field. This affects the behavior of conduction electrons and alters the values of the Hall constant. The galvanomagnetic effects are closely related to the behavior of the electron components of the outer atomic shells. The state of the outer shell may be studied with high accuracy on the basis of these effects. The character of the chemical bond between various atoms of metallic alloys may thus be explained. The authors prepared alloys from pure titanium and aluminum with an Al content up to 40 wt% by two methods: 1) powder metallurgy by pressing and sintering in vacuo at 600-1000°C for 50-100 hr. 2) melting in the arc furnace with a wear-resistant tungsten electrode. The current collectors were triangular and knife-shaped at the point of contact with the specimen. They glided along the polished lateral faces of the sample by means of micrometer screws. Test method and measuring apparatus are described in Ref. 11 (N. V. Grum-Grzhimaylo, ZhNKh, 3, no. 7, 1958). Table 1 contains the resultant mean

Metallic compounds in the range of ...

values of the Hall constant of the alloys. On the basis of these data, the authors plotted a diagram of this constant as a function of the composition (Fig. 1). Two (a and b) jumps from the linear variation of the Hall constant to another linear variation are seen. These jumps correspond to: a) the compound Ti_6Al with 14.3 atom% (9 wt%) of aluminum; b) the compound Ti_3Al with 25 atom% (16 wt%) Al. The sintered and the cast alloys showed the same behavior. The cast alloys were subjected to homogenizing heat treatment (between 600 and 900°C for 200-350 hr) immediately after measuring the Hall constant. The limited range of the solid α-solution offers considerable difficulties in the presence of two metallic compounds if the order of variations of the Hall constant has to be determined. This determination requires an increased precision of measurement which was achieved by the device applied here. The authors conclude from their data that the solid aluminum solutions in α-titanium exhibit a complicated kind of interaction owing to the existence of the two compounds Ti_6Al and Ti_3Al which apparently have a hexagonal lattice. They might result from solid solutions and correspond to compounds of the Kurnakov type (Ref. 12:. I. I. Kornilov, Izv. AN SSSR, OKhN, 1957,

Card 3/8

Metallic compounds in the range of ...

no, 4,.395). The diagrams of the Hall constant in the range of the γ-phase in alloys with 46.16 atom% (33wt%) to 53.85 atom% (40.0 wt%) aluminum show a sharp discontinuity at 50.0 atom% (36.02 wt%).aluminum. It corresponds to the compound TiAl which was detected by other methods of physicochemical analysis. The equilibrium of the compounds Ti_6Al, Ti_3Al, TiAl and the proof of their existence in the phase diagram depend on the kinetics and on the conditions of their formation which have to be further studied. The appearance of these compounds in the system Ti - Al increases the heat resistance of the alloys and rapidly decreases their plasticity at an aluminum content of more than 7-8 wt%. There are 1 figure, 1 table, and 12 references: 8 Soviet-bloc and 4 non-Soviet-bloc. The reference to the English-language publication reads as follows: M. Hansen, Constitution of binary alloys, N.Y. London, 1958, p. 139 (Ref. 1).

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences USSR)

Card 4/8

5.4800 1297also1413, 1418, 2808
5.2610

25855 S/020/61/139/004/015/025
B103/B206

AUTHORS: Kornilov, I. I., Matveyeva, N. M.

TITLE: Heat of dissociation of Kurnakov's compounds Ni_3Fe, Ni_3Mn, Ni_3Cr, and Ni_3V

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 139, no. 4, 1961, 880 - 883

TEXT: The heat of dissociation is defined as being the temperature of transition of a compound into a solid solution at the critical transition temperature. The authors recall that metallic compounds are formed from solid solutions (e. g., in the system Cu-Au, N. S. Kurnakov, S. Zhemchuzhnyy, M. Zasedatelev, ZhRFKhO, 47, 871 (1915)). In honor of their discoverer they were called Kurnakov compounds (I. I. Kornilov, Usp. khim. vyp. 9, 1045 (1952)). In publications (especially of the non-Soviet bloc, F. Rhines, J. Newkirk, Trans. Am. Soc. Metals, 45, 1029, 1953), they are considered to be the product of a single atomic regrouping connected with the ordering of the structure in the homogeneous medium, no phase transformation taking place in this case. Although in the systems Ni - Fe,

Card 1/6

Heat of dissociation of ....

Ni - Mn, and Ni - Cr the above-mentioned compounds Ni_3Me are formed from solid solutions, only a dotted line of the ordering of solid solutions used to be drawn in their equilibrium diagrams. The phase transformations mentioned might, however, be accompanied by considerable energy conversions. In comparing the phase-transformation temperatures of Ni_3Me alloys in the three systems mentioned with the heat of formation of Ni_3V and Ni_3Ti, the authors tried to gain new knowledge on the nature of transformations in these systems. They used the thermographic method by L. G. Berg and V. Ya. Anosov (Ref. 8: ZhOKh, 12, 31 (1942)) for the determination of the value of phase transformations of the systems mentioned in the title. This method is based on a comparison of the areas of peaks of differential heating curves corresponding to the thermal effects in the standard and the specimen. Iron was used as a standard. The thermal effects of the magnetic $\alpha \longrightarrow \beta$ and the polymorphous $\beta \longrightarrow \gamma$ transformation of iron are known. On the basis of their values, the authors found the relative error of determination involved in the method used here, by calculating the value of one thermal effect from that of the other. This calculated value is

Card 2/6

Heat of dissociation of ...

compared with the value in the table. The authors established that the two compared values of the $\alpha \longrightarrow \beta$ Fe transformation differ by 2 - 5%, i.e., this difference lies within the range of accuracy of the method. Besides iron, nickel was also used as a standard for the determination of the thermal effects accompanying transformations in the alloys Ni - Mn, Ni - Fe, and Ni - Cr. The areas of the thermal effects were measured by geometric integration. Ni_3Me alloys were prepared in the arc furnace in an argon atmosphere from electrolytic Ni, Fe, Mn, Cr as well as from carbothermic vanadium (V content 99.8%). On the basis of a chemical analysis, alloys corresponding stoichiometrically to Ni_3Me were used for the investigation. They were subjected to: a) high-temperature homogenization annealing, b) long lasting annealing at temperatures below the critical transformation point: All alloys were annealed at 450°C except Ni_3V which was annealed at 950°C. The thermal effects were measured after annealing for 700, 1000, and 1400 hr. Table 1 gives the results. The highest value of ΔH was obtained for Ni_3Cr with 1400 hr annealing at 450°C (0.41 kcal/g-at). This value is much lower than the ΔH values of Ni_3Fe, Ni_3Mn, and Ni_3V. The

Card 3/6

Heat of dissociation of ...

authors presume that the compound forms here very slowly, and that the alloy did not reach equilibrium. This problem is to be investigated further. The authors point out the high ΔH value which is considerably greater than 1, except for Ni_3Cr. The strength of the chemical bond might be of different nature in alloys annealed for a long time than in solid solutions. In the alloys investigated, the ordering processes are obviously linked with the formation of more stable metallic compounds. In the authors' opinion, they must have independent ranges of existence in the phase diagram of the system, and two-phase ranges as phase transformation of first kind. The authors compare the data of Table 1 with the position of the respective metals in the periodic system. It is concluded that the ΔH values of all compounds mentioned are commensurable and increase (with the exception of Ni_3Cr) with the distance of the metal contained in the compound from the position of nickel in the periodic system. Consequently, a certain dependence of the properties of chemical compounds on the position of the components in the periodic system is maintained. The strength of the chemical bond in Ni_3Fe, Ni_3Mn, Ni_3V, and Ni_3Ti is apparently also determined by the heat of formation (heat of dissociation). It

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B103/B206

Heat of dissociation of ...

increases with increasing difference of the chemical properties of the interacting metals, and is thus connected with the position of the reacting elements in the periodic system. The increasing strength of the chemical bond in the series Ni_3Fe, Ni_3Mn, Ni_3Cr, Ni_3V, and Ni_3Ti must be reflected in the mechanical strength of these compounds, which, however, is to be investigated additionally. There are 4 figures, 1 table, and 13 references: 8 Soviet-bloc and 5 non-Soviet-bloc. The two references to English-language publications read as follows: Ref. 6: P. Leech, S. Sykes, Phil. Mag., 27, No. 185 (1939); Ref. 7: O. Kubaschewski, et. al. Trans. Farad. Soc., 52, 214 (1954). The third one see in the body of the abstract.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences USSR)

PRESENTED: March 13, 1961, by I. I. Chernyayev, Academician

SUBMITTED: February 22, 1961

Card 5/6

29013

S/020/61/140/004/014/023
B106/B110

18 9200

AUTHORS: Kornilov, I. I., and Nartova, T. T.

TITLE: Continuous solid solutions of metallides Ti_3Al - Ti_3Sn in the system Ti - Al - Sn

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 140, no. 4, 1961, 829-831

TEXT: The authors studied the phase diagram of the ternary system Ti - Al - Sn. For this purpose, the properties of alloys of this system were investigated, the compositions of which are located in the section Ti_3Al - Ti_3Sn. Thermal, microstructural, and X-ray structural analyses were carried out, and electric resistance and hardness were measured. The alloys were prepared from ТГ-00 (TG-00) titanium sponge (limit of stability ~ 38 kg/mm^2), and high-purity aluminum and tin. Crystallization and phase conversion in the solid state were studied in these alloys by contactless thermal analysis in a plant designed by N. A. Nedumov (Ref. 16: ZhFKh, 34, no. 1, 184 (1960)). The phase diagram for the section Ti_3Al - Ti_3Sn was constructed on the basis of results obtained (Fig. 1).

Card 1/4 3

Continuous solid solutions ...

The alloys of this section crystallize in the form of mutually limited solid solutions on the basis of the solid β-solution of the system Ti - Al and on the basis of the compound Ti_3Sn, and form eutectic mixtures with the eutectic point at 45% of Ti_3Sn (~ 20% by weight of Sn). On slow cooling, these mixtures pass over into a continuous series of solid α(δ)-solutions with phase conversion. At 960°C, the compound Ti_3Al is obtained by prolonged tempering from the solid α(δ)-solutions of the system Ti - Al, which, in turn, forms solid solutions with the compound Ti_3Sn. In this state, the alloys of the section Ti_3Al - Ti_3Sn form continuous solid solutions with hexagonal crystal lattice. The alloys studied exemplify a complicated phase equilibrium which considerably varies with temperature and conversions in the solid state. The above-mentioned formation of the continuous series of solid solutions in long-tempered alloys may be regarded as a continuous replacement of tin atoms in the Ti_3Sn crystal lattice by aluminum atoms without change in the lattice type. There are 3 figures and 16 references: 10 Soviet and 6 non-Soviet. The three most recent references to English-language publications read as follows:

Continuous solid solutions ...

E. Ence, H. Margolin, J. Metals, 9, № 4, sect. 2, 484 (1957); D. Clark, J. C. Terry, Bull. Inst. Metals, 3, 116 (1956); P. Pietrokowsky, E. P. Frink, Trans. Am. Soc. Metals, 49, 339 (1957).

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences USSR)

PRESENTED: April 20, 1961, by I. I. Chernyayev, Academician

SUBMITTED: March 27, 1961

Card 3/4-3

VOL, Abram Yevgen'yevich; AGEYEV, N.V., red.; AKRIKOSOV, N.Kh., doktor khim.nauk, red.; KORNILOV, I.I., doktor khim.nauk, red.; SAVITSKIY, Ye.M., doktor khim.nauk, red.; OSIPOV, K.A., doktor tekhn.nauk, red.; GUSEVA, L.N., kand.khim.nauk, red.; MIRGALOVSKAYA, M.S., kand.khim.nauk, red.; SHKLOVSKAYA, I.Yu., red.; MURASHOVA, N.Ya., tekhn.red.

[Structure and properties of binary metallic systems] Stroenie i svoistva dvoinykh metallicheskikh sistem. Pod rukovodstvom N.V. Ageeva. Moskva, Fizmatgiz. Vol.2. [Systems of vanadium, bismuth, hydrogen, tungsten, gadolinium, gallium, hafnium, germanium, holmium, dysprosium, europium, iron] Sistemy vanadiia, vismuta, vodoroda, vol'frama, gadoliniia, galliia, gafniia, germaniia, gol'miia, disprozziia, evropiia, zheleza. 1962. 982 p. (MIRA 15:5)

1. Chlen-korrespondent AN SSSR (for Ageyev).
(Alloys) (Systems (Chemistry)) (Phase rule and equilibrium)

VUL'F, Boris Konstantinovich, dots.,doktor tekhn. nauk; ROMANDIN, Konstantin Platonovich, dots., kand. tekhn. nauk; DUBININ, G.N., kand. tekhn.nauk, retsenzent; KORNILOV, I.I., prof., red.; VINOGRADSKAYA, S.I., red. izd-va; PUKHLIKOVA, N.A., tekhn. red.

[Structure and properties of aircraft metals]Aviatsionnoe metallovedenie. 2. izd., perer. i dop. Pod red. I.I.Kornilova. Moskva, Oborongiz, 1962. 503 p. (MIRA 15:11)
(Steel alloys) (Nonferrous alloys)
(Airplanes--Materials)

39076
S/180/62/000/003/011/016
E193/E383

18.1275

AUTHORS: Kornilov, I.I. and Yakimova, A.M. (Moscow)

TITLE: Creep and structure of alloys of the titanium-oxygen-hydrogen and titanium-aluminium-hydrogen systems

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Metallurgiya i toplivo, no. 3, 1962, 88 - 93

TEXT: Since most Ti alloys contain H, O and Al (the first two as impurities, the last as the main strengthening alloying addition), the effect of these elements on the structure and creep-resistance of Ti was studied. The composition (wt.%) of the experimental alloys varied within the following limits: 0.1-1.63% O, 0.005-0.05% H and 1.05-7.86% Al. Creep tests were carried out at 500-550 on the Ti-O-H alloys and at 500 - 650 °C on the Ti-Al-H alloys, under a stress of 7 kg/mm^2 in the former and 15 kg/mm^2 in the latter case; the results, correlated with the results of metallographic examination, led to several conclusions. 1) The creep resistance of Ti-O-H alloys decreases

Card 1/2

Creep and structure ....

with increasing H content, oxygen having the opposite effect. Thus, for instance, the deformation of specimens containing 0.1% O and 0.005, 0.025 and 0.05% H after 5 h at 500 °C under a stress of 7 kg/mm^2 was, respectively, 10, 29 and 48 mm; the corresponding figures for alloys containing 0.05% H and 0.1, 0.2 and 1.2% O being 48, 20 and 1 mm. 2) As the O content of Ti increases, the solubility of H in the metal decreases. In addition, a change in the O content brings about redistribution of H between the α- and γ-phases. 3) The creep resistance of the Ti-Al-H alloys also decreases with increasing concentration of H, the deformation of alloys containing 3% Al with 0.005, 0.025 and 0.05% H after 50 h at 500 °C under a stress of 15 kg/mm^2 being 15, 25 and 35 mm. Increasing the Al content to 5% (or more) increases the high-temperature strength of the alloy and decreases the harmful effect of H, the deformation of alloys (after 50 h at 500 °C under 15 kg/mm^2), containing 8% Al with 0.005, 0.025 and 0.05% H being; respectively, 2, 3 and 4 mm. 4) As the Al content of the Ti-Al-H alloy increases, the solubility of H also increases from 0.025% at 3% Al to 0.05% at 5% Al.

SUBMITTED: October 17, 1960

Card 2/2

40724

S/180/62/000/004/004/009
E040/E435

18.8200
18 8100

AUTHORS: Ko-Chih-Ming, Kornilov, I.I., Pylayeva, Ye.N. (Moscow)

TITLE: Investigation of the structure and properties of titanium-aluminium-molybdenum alloys

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Metallurgiya i toplivo, no.4, 1962, 114-118

TEXT: Using the hot-hardness technique for a rapid assessment of the alloy properties as a function of temperature, an examination was made of the hot-hardness and creep of titanium-corner alloys of the Ti-Al-Mo ternary system along sections parallel to the Ti-Mo side of the concentration triangle at aluminium contents of 0, 5, 10, 15, 20 and 36% and at molybdenum contents from 0 to 10%. The tests were made in ВИМ-1М (VIM-1M) vacuum machine. The test specimens were melted in an arc-furnace with a non-consumable tungsten electrode in an argon atmosphere and were vacuum-annealed at 1100°C for 24 hours, then annealed again for 24 hours at 600°C and finally cooled with the furnace. The hardness (1 kg load) was determined in the interval 20 to 1000°C (in 100°C stages) after a holding time of 1 minute. The

Card 1/3

Investigation of the structure ...

hardness of titanium and of its alloy with 5% Al dropped progressively with rising temperature, whereas the hardness of alloys with 10, 15 and 20% Al changes little up to about 700 to 800°C. Molybdenum additions have a much less beneficial effect on the hardness of titanium, especially at high temperatures: the hardness of binary titanium alloys with up to 5% Mo decreased with rising temperature. The hardness of titanium remained unchanged as the temperature increased to 500 to 600°C if the molybdenum content was raised to 10%. Studies of the effect of molybdenum additions on the hardness of Ti-Al alloys showed that the hardness at room temperature rises when the Mo content is from 3 to 10%; at higher temperatures the hardness drops. The creep of the alloys was examined at 700°C using a method described previously (Osipov, K.A., T'ien-te-Cheng. Izv.AN SSSR.OTN. M i T., no.4, 1959). Molybdenum concentrations up to 1 - 3% increase the resistance of titanium to plastic deformation at 700°C but this effect disappears almost completely if the molybdenum concentration is raised to 10%. In ternary Ti alloys (with 5, 15 and 20% Al), the highest heat resistance at 700°C was observed in alloys with

Card 2/3

188200
18 1285

40725

S/180/62/000/004/005/009
E071/E133

AUTHORS: Kornilov, I.I., and Yakimova, A.M. (Moscow)

TITLE: Creep and structure of titanium-chromium and titanium-molybdenum alloys containing hydrogen

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Metallurgiya i toplivo, no.4, 1962, 119-125

TEXT: Since chromium and molybdenum enter the composition of many heat resistant titanium alloys, the creep and structure of Ti-Cr-H and Ti-Mo-H ternary systems was investigated. The alloys were prepared in a laboratory arc furnace with a tungsten electrode in an atmosphere of purified argon. Specimens used were in the form of hot rolled rods 8 mm in diameter. Before saturation with hydrogen, all specimens were vacuo treated (10^{-4} mm Hg) at 700 °C for 24 hours and cooled with the furnace. Saturation with hydrogen at 700 °C for 10 hours and cooling with the furnace. The specimens were tested for creep by the centrifugical method directly after hydrogen saturation without any additional heat treatment. The chemical composition of alloys investigated is given (Cr and Mo

Card 1/2

Creep and structure of ...

from 0.5 to 30%). The microstructure of the alloys was studied by metallographic and microhardness methods. On the basis of the results obtained it was concluded that: 1) Hydrogen decreases the resistance to creep of alloys containing from 0.5 to 15% Cr. 2) With increasing chromium content from 3 to 7% the solubility of hydrogen in titanium increases from 0.05 to 0.5%. 3) In titanium alloy containing 7% Cr, hydrogen strengthens both the α and β phases. At 15% Cr the microhardness of the β phase decreases with increasing concentration of hydrogen due to the decomposition of the β phase and its impoverishment in chromium. 4) The resistance to creep of alloys of titanium with 3 and 10% Mo decreases strongly with increasing hydrogen content. On increasing the Mo content in alloys up to 20 and 30%, their resistance to creep increases. 5) The solubility of hydrogen in titanium increases with increasing molybdenum content.

There are 5 figures and 2 tables.

SUBMITTED: October 17, 1960

Card 2/2

36634

S/062/62/000/004/003/013
B110/B101

18.1700

AUTHORS: Kornilov, I. I., and Polyakova, R. S.

TITLE: Study in the field of metal chemistry. Communication 3. Metallochemical properties of niobium

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye khimicheskikh nauk, no. 4, 1962, 565-573

TEXT: Niobium takes an intermediate position if the elements of the periodic system are arranged according to their electronegativity. 36 metals are electropositive, and nearly 40 are electronegative as compared with Nb, which explains its tendency of forming solid solutions with metals of similar electronegativity, and metallic compounds with elements of different electronegativity: (1) Nb forms a continuous series of solid solutions with metals whose atomic radii do not differ from its by more than 8-10%, and whose electronegativity is similar. (2) The formation of continuous solid solutions requires an isomorphous crystal structure of the components. (3) Limited solid solutions are formed with differences in atomic radii of 8-10 to 15-16% and with slightly varying

Card 1/3

Study in the field of metal ...

electronegativity. (4) The greater the difference in electronegativity, the greater the tendency of forming compounds. The metals β-Ti, β-Zr, V, Ta, Pa, Mo, W, and U constitute the first family of elements forming a continuous series of solid solutions. The second family (Be, Sc, Y, La, Ac, Hf, Th, Cr, Mn, Tc, Re, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, B, Al, Ga, In, Tl, C, Si, Ge, Sn, Pb, N, P, As, Sb, and Bi) and 10 elements of the actinoid group (altogether 68 elements) form limited solid solutions with Nb. The more electronegative the alloy metal compared with Nb, the more compounds are formed. The third family (S, Se, Te, Po, F, Cl, Br, I, and At) forms, with Nb, only compounds with covalent or ion bonds. Some of these compounds have semi-conducting properties. An intermediate position is taken by O, N, B, C, and some other metalloids which, according to their reactions with Nb, belong to the second family but form, with Nb, some compounds with covalent bonds. The fourth group consists of elements that do not react with Nb (Li, Na, K, Rb, Cs, Fr, Mg, Ca, Sr, Ba, and Ra) and inert gases (He, Ne, Ar, Kr, Xe, and Rn). The metals of this group are more electropositive than Nb, and differ very much in the ionic radius from the latter. Metal systems with a given number of elements can be well

Card 2/3

KORNILOV, I. I. (Moskva); MARTOVA, T. T. (Moskva)

Stress-rupture strength at 700° in alloys on a Ti Al compound base. Izv. AN SSSR. Otd. tekh. nauk. Met. i topl. no.6:142-146 N-D '62. (MIRA 16:1)

(Titanium-aluminum alloys—Testing)
(Metals at high temperatures)

S/598/62/000/007/001/040
D267/D307

AUTHOR: Kornilov, I. I.

TITLE: Metal chemistry of titanium alloys and the further tasks of research

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Titan i yego splavy. no. 7, Moscow, 1962, Metallokhimiya i novyye splavy, 5-25

TEXT: In view of the ever increasing significance of titanium alloys in engineering a detailed survey of this field is given. There are in all 17 elements (groups 0, Ia and IIa, except Be) which do not form solutions or compounds with Ti; 9 elements (groups VIb and VIIb, except oxygen) form with Ti many compounds characterized by ionic or covalent bonds; 45 elements (including groups Ib - IVb, VIIa, VIIIa) not only form with Ti various compounds, but also can form solutions in it; finally 9 elements (Zr, Hf, V, Nb, Ta, Cr, Mo, W and U) form with Ti a continuous se-

Card 1/3

ries of solid solutions. The solubility of elements in Ti decreases as the difference between the chemical properties of Ti and the element in question increases. There are 4 fundamental types of phase diagrams of binary Ti systems. The problem of phase equilibria in these systems cannot be solved unless chemical reactions between the elements in solid solutions are allowed for. From the behavior of Ti in binary systems it is possible to obtain the general features of its behavior in ternary and more complex systems. As regards the properties of mechanical strength and heat resistance, various binary, ternary and more complex alloys are adduced and described. The tasks to be given attention in the next future relate to the further improvement of the quality of Ti used as initial product for high-grade alloys and the improvement of the technology and investigation of new high-strength Ti alloys. In this connection it is indispensable to reduce the content of O, N and H below certain limits, and this cannot be attained without refining the metal. It is important to conduct further studies of new alloys based on the so-called intermetallic solid solutions, and of the Ti-Al, Ti-Sn and some ternary systems. Various fields

S/598/62/000/007/001/040
D267/D307

Metal chemistry of ...

of application of titanium and its alloys are described. There are 14 figures and 6 tables. The most important English-language references read as follows: M. Hansen, 'Constitution of binary alloys', McGraw Hill, New York, 1958; J. H. Westbrook (ed.), 'Mechanical properties of intermetallic compounds', John Wiley and Sons, New York, 1960.

Card 3/3

S/598/62/000/007/011/040
D244/D307

18,1285

AUTHORS: Kornilov, I. I., Pylayeva, Ye. N. and Volkova, M. A.

TITLE: Properties of the alloys of the ternary titanium-aluminum-vanadium system

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Titan i yego splavy. no. 7, Moscow, 1962. Metallokhimiya i novyye splavy, 89-94

TEXT: The work is a continuation of previous investigations of Ti-Al and Ti-Al-Fe alloys. In this investigation the heat stability of Ti rich alloys of ternary system Ti-Al-V was investigated. Microstructure of the alloys at 600°C included either one α-phase or two phases α and (α + β). The alloy with 7.5% Al and 0.5% V had a single phase structure of α-solid solution and the alloy with 7.5% Al and 4% V consisted of (α + β) phases. The heat stability was determined by the method of centrifugal bending under a tension of 15 kg/mm^2 at 550°C. For alloys containing 5% Al, additions of V from 0.5 to 1% did not decrease their heat stability. Further in-

Card 1/2

S/598/62/000/007/012/040
D244/D307

AUTHORS: Kornilov, I. I. and Nartova, T. T.

TITLE: Phase diagram of the ternary titanium-aluminum-tin system

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Titan i yego splavy. no. 7, Moscow, 1962. Metallokhimiya i novyye splavy, 95-104

TEXT: The authors investigated a part of ternary system Ti-Al-Sn, close to the Ti corner of the triangular diagram, using thermal, microstructural and X-ray analysis. The maximum Al-Sn content of the system was 45%. Two polythermic sections of the system were constructed: A radial section passing through the compositions corresponding to compounds Ti_3Al and Ti_3Sn. The following phases were present in the system at 600°C: 1) Large area of solid solution of Al and Sn in α-Ti with the hexagonal structure; 2) continuous solid solution based on Ti_3Al and Ti_3Sn with an isomorphic

Card 1/2

S/598/62/000/007/012/040
D244/D307

Phase diagram of the ...

α(ò)-hexagonal structure; 3) limited γ-solid solution based on compound TiAl with the hexagonal structure; 4) two-phase regions α + ò and α(ò) + γ. A similar distribution of phases existed at 800°C. At 1000°C the area of ß-solid solution close to the pure Ti point of the diagram extended from the side of Ti-Al (5.5% Al) to Ti-Sn side (~22% Sn). A large part of the diagram was covered by two-phase region ß + α(ò), the extent of the continuous α(ò) solid solutions decreased and that of γ-solid ternary solution increased in comparison with the section at 600°C. At 1200°C the solid solution of Al and Sn occupied a considerable part of the diagram. The majority of investigated alloys underwent a solid state transition connected with polymorphic α ⇄ ß-Ti transition. There are 8 figures.

Card 2/2

3.8696

S/598/62/000/007/016/040
D290/D307

18.1285

AUTHORS: Kornilov, I. I., Mikheyev, V. S. and Belousov, O. K.

TITLE: The main properties of solid solutions with an α-titanium base at -196°C

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Titan i yego splavy. no. 7, Moscow, 1962. Metallokhimiya i novyye splavy, 120-126

TEXT: Properties of alloys derived from three ternary systems with an α-Ti base were studied in continuation of earlier studies of ternary Ti systems by one of the authors, and was motivated by the lack of systematic information about Ti alloys at low temperatures. The authors studied Ti-Zr-Mo, Ti-Zr-V, and Ti-Zr-Nb systems containing 1.3 atomic percent of Zr and variable amounts (up to 5 atomic percent) of the third component. Phase diagrams in the region of the polymorphous transformation were constructed using microstructural and thermal analyses and electrical resistance measurements. Mechanical properties of the α-solid solutions were studied; the

Card 1/2

Card 2/2

38697
S/598/62/000/007/018/040
D290/D307

18.1285

AUTHORS: Kornilov, I. I., Mikheyev, V. S., Pylayeva, Ye. N., Volkova, M. A., Borok, B. A., Shchegoleva, R. P. and Golubeva, L. S.

TITLE: The effect of aluminum on the structure and properties of a Ti-Al-Cr-Fe-Si-B alloy prepared by powder metallurgy

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Titan i yego splavy. no. 7, Moscow, 1962. Metallokhimiya i novyye splavy, 130-134

TEXT: The authors studied the effect of varying amounts of Al in Ti-Al alloys (1 - 7% by weight Al) and in alloys of the Ti-Al-Cr-Fe-Si-B system (1.5 - 12% by weight Al) on the structure and properties of the alloys. Strength of the Ti-Al alloys increased from 77.2 to 107-3 kg/mm^2 as the Al content rose from 0 to 7%; the strength of alloy AT4 (AT4) increased from 104 to 142 kg/mm^2 as the Al content rose from 1.5 to 10%. Plasticities of the alloys decreased and the heat resistance of AT4 increased as the aluminum

Card 1/2

The effect of aluminum ...

contents became higher. The rate of oxidation of AT4 in air at 700°C decreases by about 60% as the Al content rose from 5 to 12% by weight. There are 4 figures and 4 tables.

Card 2/2

3 8698
S/598/62/000/007/019/040
D290/D307

IP. 1225

AUTHORS: Kornilov, I. I., Pylayeva, Ye. N., Volkova, M. A., Borok, B. A., Shchegoleva, R. P. and Golubeva, L. S.

TITLE: The effect of silicon on the properties of a 6-component alloy of the system Ti-Al-Cr-Fe-Si-B prepared by powder metallurgy

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Titan i yego splavy. no. 7, Moscow, 1962. Metallokhimiya i novyye splavy, 136-139

TEXT: The authors studied the effect of varying amounts of silicon in Ti-Si alloys and in alloys of the system Ti-Al-Cr-Fe-Si-B on the properties of the alloys, in order to find the optimum Si concentration in alloy АТ4 (AT4). The mechanical properties were measured in both the forged and hot worked conditions. The strength of the Ti-Si alloy increased from 77.2 to 100.8 kg/mm^2 as the Si content increased from 0 - 2% while the strength of the alloy AT4 increased from 110 to 138 kg/mm^2 with the addition of 1.5% Si. Pla-

Card 1/2

S/598/62/000/007/019/040
D290/D307

The effect of silicon ...

sticities of the alloys decreased with rising Si content. AT4 containing 0.5% Si withstands a continuous stress of 30 kg/mm^2 at 500°C for about 100 hours. The corrosion resistance of AT4 at 700°C is approximately doubled by the addition of 0.5% Si. There are 4 figures and 4 tables.

Card 2/2

S/598/62/000/007/020/040
D290/D307

18.1225

AUTHORS: Kornilov, I. I., Mikheyev, V. S., Chernova, T. S. and Markovich, K. P.

TITLE: The basic properties of titanium alloys AT3 (AT3), AT4 (AT4), AT6 (AT6) and AT8 (AT8)

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Titan i yego splavy. no. 7, Moscow, 1962. Metallokhimiya i novyye splavy, 140-149

TEXT: Properties of the above alloys, which are related to the system Ti-Al-Cr-Fe-Si-B were studied; the Al content varied from 2.5 to 7.5% by weight while the total Cr, Fe, Si and B content was in the range of 1.0 - 1.8%. The alloys can be melted under works conditions in vacuum arc furnaces and are subjected to the same forging, rolling and hot working processes as all standard and experimental Ti alloys. A section of the phase diagram was constructed from the results of thermal and microstructural analyses and measurements of the temperature of the solidus. Mechani-

Card 1/2

The basic properties ...

cal properties were comprehensively measured and their limits found for many specimens; the properties of industrially produced alloy specimens were found to be within these limits. Temperature variations of the mechanical properties, long-run strengths, creep and elasticity moduli of the alloys were measured in the range 20 - 650°C. There are 6 figures and 8 tables.

/B

Card 2/2

S/598/62/000/007/025/040
D217/D307

18.1215

AUTHORS: Kornilov, I. I., Mikheyev, V. S. and Chernova, T. S.

TITLE: Thermal stability and change in properties of titanium alloys АТ3 (AT3), АТ4 (AT4), АТ6 (AT6) and АТ8 (AT8) during ageing

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Titan i yego splavy. no. 7, Moscow, 1962. Metallokhimiya i novyye splavy, 185-190

TEXT: Thermal stability of the above alloys, after soaking for 100 hours at 400, 450 and 500°C, was determined by the change in mechanical properties and microstructure of the alloys before and after ageing. Ageing was studied on specimens received from laboratory and experimental production melts, the ingots being 1.2, 20, 50 and 400 kg in weight. All ingots were melted in vacuum arc furnaces with soluble electrodes. The ingots obtained were forged at 1000 - 1200°C into rods of 12 - 14 mm diameter. These were aged and then specimens for mechanical testing were cut from them. It

Card 1/2

Thermal stability and ...

was found that the alloys AT3, AT4, AT6 and AT8 from laboratory melts which contain average or below average total alloy contents are thermally stable at 450 and 500°C after ageing for 100 hours. They do not become enbrittled and do not exhibit any noticeable changes in mechanical properties. Only alloys containing above a certain limit of impurity content age and become brittle. Alloys AT3, AT4 and AT6 from the production melts exhibited thermal stability after ageing at 400, 450 and 500°C for 100 hours. There are 4 figures and 4 tables.

Card 2/2

18.1285

AUTHORS: Kornilov, I. I., Mikheyev, V. S. and Chernova, T. S.

TITLE: Influence of annealing in air and in vacuum on the plastic properties of sheet materials made from titanium alloys AT3 (AT3), AT4 (AT4), OT4-1 (OT4-1) and OT4 (OT4)

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Titan i yego splavy. no. 7, Moscow, 1962. Metallokhimiya i novyye splavy, 191-196

TEXT: Alloys of the AT series are 6-component complexes containing Ti-Al-Cr-Fe-Si-B and differing from each other in their Al content. The above alloys, in the form of sheet of 1 mm thickness, were annealed in air and in vacuo between 600 - 1000°C, at 50° intervals, and the change in plastic properties was determined by the change in angle of bend of the sheets after annealing. Soaking time at each temperature was 30 minutes. The optimum conditions of heat treatment for annealing in vacuo and air were de-

Card 1/2

40979

18.1000

S/659/62/009/000/013/030
I003/I203

AUTHOR: Kornilov, I. I.

TITLE: The physicochemical theory of heat-resistance

SOURCE: Akademiya nauk SSSR, Institut metallurgii. Issledovaniya po zharoprochnym splavam, v. 9. 1962. Materialy Nauchnoy sessii po zharoprochnym splavam (1961 g.), 96–107

TEXT: Various aspects of this problem are discussed, such as the existing theories of heat resistance, the nature of the influence of various chemical elements and intermetallic compounds, and of the rates of various physicochemical processes on the heat resistance of alloys. The conclusion is drawn that from the physicochemical point of view there are two main mechanisms by which the heat-resistance of alloys is increased. The first is the formation of solid solutions, and the second the precipitation of strengthening phases from supersaturated solid solutions. In the following discussion, M. B. Makogon reported on his investigations of the mechanical properties of Pb-Bi and Cd-Hg alloys. His results confirm the thesis put forward in the present article. There are 3 figures.

Cable 1/1

KORNILOV, I.I.; PRYAKHINA, L.I.; RYABTSEV, L.A.

High-temperature strength of binary and multi-component nickel alloys. Issl. po zharopr. splav. 9:114-119 '62. (MIRA 16:6)
(Nickel alloys--Testing)
(Metals at high temperature)

3(8)62
S/078/62/007/003/008/019
B110/B138

12.1255

AUTHORS: Kornilov, I. I., Pylayeva, Ye. N.

TITLE: Constitution diagram of the tantalum - nickel system

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 7, no. 3, 1962, 590-595

TEXT: From the results of this study the complete constitution diagram of the binary system tantalum - nickel was constructed. 10 g of tantalum (99.8%) and 10 g of H-C(N-O) nickel were induction melted in suspension in a purified He atmosphere. The resulting alloys were submitted to thermal, microstructural, and X-ray structural analyses, and hardness tests. The solidus temperatures of the Ta-rich alloys were measured on an optical pyrometer, and those of alloy crystallization on a Kurnakov pyrometer and with non contact thermography. The liquidus has six branches: (1) crystallization of the β solid solution on a Ta base; (2) Ta_2Ni; (3) TaNi; (4) $TaNi_2$; (5) $TaNi_3$, and (6) α solid solution on a Ni base. The liquidus branches intersecting at 1785, 1570, and 1420°C correspond to the following peritectic equilibria: β + melt ⇌ Ta_2Ni; Ta_2Ni + melt ⇌ TaNi; melt + $TaNi_3$

Card 1/3

Constitution diagram of the ...

$\rightleftharpoons TaNi_2$; and at 1320 and 1360°C, to the eutectic reactions: melt $\rightleftharpoons$ TaNi + $TaNi_2$; melt $\rightleftharpoons TaNi_3$ + Ni solid solution. Three new compounds were detected: Ta_2Ni (66.6 atomic % or 86.25 weight % Ta); TaNi (50.0 atomic % or 76.05 weight % Ta); $TaNi_2$ (33.3 atomic % or 60.88 weight % Ta). The microstructure was examined in cast alloys quenched from 1600, 1500, 1400, 1300, and 1200°C (soaking time 100 hrs each), and others annealed for 50 hrs at 1110°C, 100 hrs at 1000°C, and 250 hrs at 800°C. At 94 atomic % Ta after quenching from 1600°C, polyhedra of a solid solution were formed. At 95.89 atomic % Ta and quenching from 1500° a second phase was precipitated within and on the grain boundaries. At 99.62 atomic % Ta and quenching from 1300°C the solid solution began to disintegrate. Ta_2Ni is formed from the peritectic reaction which takes place at 80.10% Ta after quenching from 1300°C. Ta_2Ni (66.6 atomic % Ta) has a dendritic structure in the cast state which changes into polyhedral after prolonged annealing at a high temperature. At 60.44% Ta, there is a peritectic reaction between melt and Ta_2Ni with formation of TaNi. After prolonged annealing TaNi (50 % Ta) assumes a polyhedral structure. A eutectic reaction occurs between TaNi and $TaNi_2$ in the

Card 2/3

KORNILOV, I.I.; MATVEYEVA, N.M.

Metallurgical chemistry of vanadium. Usp.khim. 31 no.9: 1076-1103 S '62. (MIRA 15:9)

1. Institut metallurgii imeni A.A.Baykova.
(Vanadium) (Chemistry, Metallurgic)

19.1285

40186
S/020/62/145/005/019/020
B101/B144

AUTHORS: Belousov, O. K., Kornilov, I. I., and Mikheyev, V. S.

TITLE: Examination of α-titanium solid solutions highly ductile at -196°C

PERIODICAL: Akademiya nauk SSSR.. Doklady, v. 145, no. 5, 1962, 1102-1105

TEXT: Alloys based on solid α-solutions of the ternary systems Ti-Zr-Mo, Ti-Zr-V, and Ti-Zr-Nb were melted in an electric vacuum furnace to increase the durability of titanium without making it less ductile. The resulting solid α-solutions showed a satisfactory ultimate strength σ_B and impact strength a_k at room temperature and also at -196°C. Alloys with heterogeneous α + β structure, however, showed low ductility at -196°C. The alloys with optimum properties were designated AT-2 (AT-2); data for three of these are compared below with the data for other constructional metals, the best being the AT-2-4 which contains Nb:

Card 1/3

Alloy	Data at 20°C: σ_B kg/mm²	δ,%	ψ,%	a_k kgm/cm²	Data at -196°C: σ_B kg/mm²	δ,%	ψ,%	a_k kgm/cm²
Pure TT-00(TG-00) Ti	35	50	80	25-30	60	32	65	23
AT-2-1	80.0	20.9	65.5	17.8	119.5	13.8	37.6	11.2
AT-2-2	75.6	23.9	69.4	19.2	116.0	12.5	44.6	15.8
AT-2-4	65.5	25.0	71.2	24.1	98.6	19.4	69.8	20.3
Duraluminum	40.0	-	-	4.2	50.0	-	-	3.24
Armco iron	32.0	-	-	24.07	78.5	-	-	0.13
Kh-3-N (Kh-3-N) steel	99.7	-	-	11.77	-	-	-	4.05
U-4 (U-4) steel	95.0	-	-	12.15	-	-	-	0.68

The alloys produced on industrial scale confirmed the results of laboratory experiments. Solid α-solutions of the systems Ti-Zr-Ta, Ti-Mo-Ta, and Ti-V-Ta are likewise assumed to have a high impact strength at -196°C. There are 3 figures and 1 table.

ASSOCIATION: Institut metallurgii im. A. A. Baykova (Institute of Metallurgy imeni A. A. Baykov)

Card 2/3

KORNILOV, I.I.; MATVEYEVA, N.M.

Creep rate of the $MnNi_3$ compound as dependent on the equilibrium state. Dokl. AN SSSR 146 no.3:642-643 S '62. (MIRA 15:10)

1. Institut metallurgii im. A.A.Baykova. Predstavleno adakemikom A.A.Bochvarom.

(Manganese-nickel alloys) (Creep of metals)

S/279/63/000/001/016/023
E111/E452

AUTHOR: Kornilov, I.I. (Moscow)

TITLE: Investigations in the metal chemistry of titanium

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Metallurgiya i gornoye delo, no.1, 1963, 152-160

TEXT: This is a continuation of the author's work on the metal chemistry of titanium. He describes, mainly for binary systems, some of the relationships governing the limiting concentrations of alpha- and beta-solid solutions of titanium and of the peritectic, peritectoidal, eutectic and eutectoidal reactions of titanium systems. He considers these in relation to the electron structure of the atoms and the positions of the reacting elements in the periodic table. Zr and Hf show continuous alpha- and beta-solid solutions with collective distribution of outer electrons in the interionic space of the solid solution. Th forms only partial solid solutions. V, Nb, Ta and Mo form continuous solid solutions with beta- and partial with alpha-titanium; Cr and U are similar but show a eutectoid transformation; the behavior of

Card 1/2

Investigations in the metal ...

W needs further investigation. The forms of the equilibrium diagrams obtained with V, Cr, Mn, Fe, Co, Ni and Cu can be interpreted in terms of their outer-electron arrangement. With elements of period II the greater difference between their metal-chemical properties and those of titanium, and in their atomic radii, lead to lower solubilities and a tendency to form compounds. The suboxides, subnitrides etc are of most interest and the author has started an investigation of the Ti-O system. In group IV there is no obvious relationship between the solubility and electronic structure of the elements; some (Ti-Si, Ti-Pb) show eutectoid and other (Ti-C, Ti-Ge and Ti-Sn) peritectoid transformations. Group III elements provide important indications on solubility and peritectoid reactions. The general rules derived by the author are relevant to studies of little known or unknown binary titanium systems and can provide a basis for the theoretical and experimental investigation of the nature of titanium reactions in ternary and more complicated systems. There are 5 figures.

SUBMITTED: April 5, 1962

Card 2/2

KORNILOV, I.I.

Certain regularities in the heat resistance of titanium alloys. Metalloved. i term. obr. met. no.2:7-12 F '63. (MIRA 16:3)
(Titanium alloys—Thermal properties)

KORNILOV, I.I.; MIKHEYEV, V.S.; CHERNOVA, T.S.

Heat treatment of titanium alloys in the five-component system Ti - Al - Cr - Fe - Si. Metalloved. i term. obr. met. no.2: 52-54 F '63. (MIRA 16:3)
(Titanium-aluminum-chromium alloys--Metallography)
(Annealing of metals)

KORNILOV, I.I.; VUL'F, B.K.; YUDINA, S.A.

Heat treatment of titanium alloys in a six-component system Ti - Al - Cr - Fe - Si - B. Metalloved. i term. obr. met. no.2:54-56 F '63. (MIRA 16:3)
(Titanium alloys--Heat treatment)

L 1290-63 EWP(q)/EWT(m)/BDS--AFFTC/ASD--JD

ACCESSION NR: AP3000914 S/0279/63/000/002/0130/0135

54

AUTHOR: Belousov, O. K. (Moscow); Kornilov, I. I. (Moscow); Mikheyev, V. S. (Moscow)

TITLE: Mechanical properties of solid solutions of Alpha-titanium at -196°C

SOURCE: AN SSSR. Izv. otd. tekh. nauk. Metallurgiya i gornoye delo, no. 2, 1963, 130-135

TOPIC TAGS: ternary Ti-base alloy, Ti-Zr-Mo alloy, Ti-Zr-V alloy, Ti-Zr-Nb alloy, cryogenic effect, AT-2 alloy, cryogenic alloy

ABSTRACT: Three series of ternary Ti-base alloys, Ti-Zr-Mo, Ti-Zr-V, and Ti-Zr-Nb, have been studied in a search for a material for service at cryogenic temperatures. All alloys (six in each series) had the same Zr content, approximately 2.5%. The Mo, V, and Nb contents varied from 0.34 to 4.88, 0.19 to 4.81, and 0.32 to 3.16%, respectively. The solubility of V, Nb, and Mo in Ti-2.5% Zr alloy at 800C was found to be 0.5, 1.0, and 0.3—0.4% for alloys made with iodide titanium, and 0.9 to 1.0, 1.5, and 0.5% for alloys made with TG-00 titanium sponge. With decreasing temperature the solubility of V, Nb, and Mo increases. The alloys designed to have an α or α + β structure were melted in a vacuum-arc consumable-electrode furnace from TG-00 titanium sponge (99.85% pure

Card 1/3

L 11290-63
ACCESSION NR: AP3000914

iodide Zr, 99.90% pure Mo, Nb (98.8% Nb, 0.5% Ta), and 99.85% pure V), forged at 950—1000C, annealed at 750C for 40 min, and furnace cooled. Mechanical tests showed that with increasing Mo, V, or Nb content the tensile and yield strengths increase and ductility decreases at both +20 and -196C. The notch toughness-composition curves show a maximum at 0.70% Mo, 0.50% V, and 1.00% Nb for -196C and at 1.40% Mo, 2.30% V, and 1.60% Nb for 20C. Ti-Zr-Nb alloys with 0.32 to 1.84% Nb have the highest notch toughness —2.15—24.1 mkg/cm^2 and 20.0—19.6 mkg/cm^2 at +20 and -196C, respectively. A sharp drop in impact toughness occurs in all systems with the appearance of the β-phase in the alloy structure. On the basis of these experiments a new series of alloys, designated AT-2, has been developed. These alloys have an average tensile strength of 60—80 kg/mm^2 at +20C, which is slightly lower than that of other Ti-alloys, but their notch toughness at both +20 and -196C is much higher. Similar high-ductility alloys may exist in other systems of Ti with its analogs Zr and Hf and metals close to Ti in the periodic system. The assumption has been verified experimentally with regard to Ti-V-Nb, Ti-V-Mo, and Ti-Nb-Mo systems and is expected to be true with regard to Ti-Zr-Ta, Ti-Mo-Ta, Ti-V-Ta, and other analogous ternary and more complex systems. Orig. art. has: 2 tables and 3 figures.

ASSOCIATION: none

Card 2/3

KORNILOV, I.I. (Moskva); SHINYAYEV, A.Ya. (Moskva); PYLAYEVA, Ye.N. (Moskva)

Creep of certain metal compounds. Izv. AN SSSR. Met. i gor. delo no.5:113-115 S-O '63. (MIRA 16:11)

KORNILOV, I.I.

Investigations in the field of the chemistry of titanium metal. Titan i ego splavy no.10:5-13 '63. (MIRA 17:1)

ACCESSION NR: AT4007024 S/2598/63/000/010/0027/0036

AUTHOR: Belousov, O. K.; Kornilov, I. I.; Mikheyev, V. S.

TITLE: Phase diagram of the titanium-vanadium-niobium-molybdenum system

SOURCE: AN SSSR. Institut metallurgii. Titan i yego splavy*, no. 10, 1963. Issledovaniya titanovy*kh splavov, 27-36

TOPIC TAGS: titanium molybdenum niobium alloy, titanium quaternary alloy, titanium alloy, phase diagram, titanium alloy structure, component solubility, alloy component solubility, vanadium containing alloy

ABSTRACT: In a study of the Ti-V-Nb-Mo system, isothermic cross sections were constructed from microstructure analysis and measurements of hardness and electrical resistivity at 600, 700 and 800C. Solubilities of the 3 admixtures in α-Ti are given in Table 1 of the Enclosure. Of special interest is a sharp phase boundary change occurring during the α-Ti + β - Ti $\rightarrow$ β-Ti transformation, which was observed by measurement of electrical resistivity while slowly heating (1-2C/min.) the specimen from 0 to 1000C. Upon quenching the alloy system from the β-phase, marked changes appeared that correspond to occurrence of metastable phases. The phase diagram of the Ti-V-Cb-Mb

Card 1/4

ACCESSION NR: AT4007024

alloy system is shown in Figure 1 of the Enclosure. Orig. art. has: 6 metallographic sections, 2 tables, 3 graphs, and 8 phase diagrams.

ASSOCIATION: Institut metallurgii AN SSSR (Metallurgical Institute AN SSSR)

SUBMITTED: 00 DATE ACQ: 27Dec63 ENCL: 02

SUB CODE: MM NO REF SOV: 008 OTHER: 005

Card 2/4

ACCESSION NR: AT4007024

ENCLOSURE: 01

TABLE 1

Solubility in α - Ti

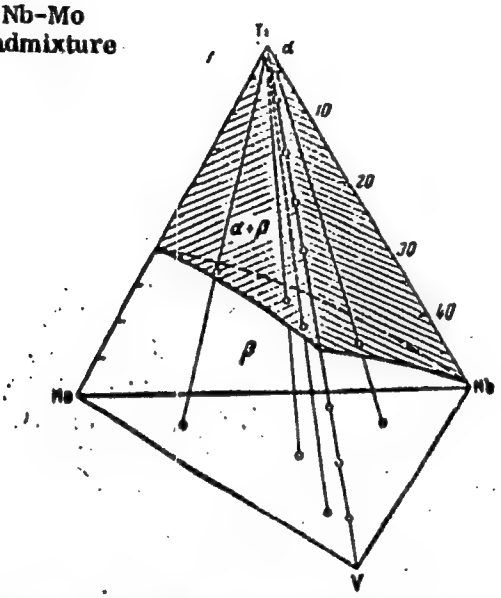
Temperature °C	V	Cb	Mo
600	2.2-2.3%	3.6-3.8%	1.2%
700	1.5%	3.0%	0.8-0.9%
800	0.9-1.0%	1.5%	0.5%

Card 3/4

ACCESSION NR: AT4007024

ENCLOSURE: 02

Fig. 1 - Phase diagram of the Ti-V-Nb-Mo system at 600C and a total admixture concentration up to 50%.



Card 4/4

KORNILOV, I.I.; PYLAYEVA, Ye.N.; VOLKOVA, M.A.

Review of the investigation of the constitutional diagram of the binary system Ti - Al. Titan i ego splavy no.10:74-85 '63. (MIRA 17:1)

ACCESSION NR: AT4007029 S/2598/63/000/010/0086/0094

AUTHOR: Boriskina, N. G.; Kornilov, I. I.

TITLE: Phase composition of alloys of Ti-Al-Cr.-Fe-Si system, containing 6% Al and 0.3% Si

SOURCE: AN SSSR. Institut metallurgii. Titan i yego splavy*, no. 10, 1963. Issledovaniya titanovy*kh splavov, 86-94

TOPIC TAGS: titanium alloy, titanium aluminum chromium alloy, iron containing alloy, silicon containing alloy, phase composition, alloy property

ABSTRACT: In continuation of earlier work on titanium-rich alloys, ten Ti-Al-Cr-Fe-Si alloys containing 63.7 to 93.5% Ti, 6% Al and 0.3% Si were arc-melted in an argon atmosphere, forged at 1000-1200C and variously heat treated. Through microstructure analysis, X-ray analysis, and measurement of hardness and electrical resistivity, phase components were identified and solubility ranges of Fe and Cr were established for α and β Ti at 500, 800, 1000 and 1100C. From 500 to 800C, only 0.4% of Fe + Cr dissolves in α Ti (See Figure 1 in the Enclosure). Results of tests for hardness and electrical resistivity are shown in Figures 2 and 3 of the Enclosure, respectively. Orig. art. has 8 metallographic sections, 6 graphs and 4 phase diagrams.

Card 1/6

ACCESSION NR: AT4007029

ASSOCIATION: Institut metallurgii AN SSSR (Metallurgical Institute AN SSSR)

SUBMITTED: 00 DATE ACQ: 27Dec63 ENCL: 04

SUB CODE: MM NO REF SOV: 008 OTHER: 003

Card 2/2

ACCESSION NR: AT4013944 S/2659/63/010/000/0168/0174

AUTHOR: Kornilov, I. I.; Pryakhina, L. I.; Ozhimkova, O. V.

TITLE: The effect of prolonged aging on the phase composition, structure and properties of the alloys of a Ni - Cr - W - Ti - Al system

SOURCE: AN SSSR. Institut metallurgii. Issledovaniya po zharoprochnym splavam, v. 10, 1963, 168-174

TOPIC TAGS: alloy aging, alloy phase composition, alloy heat resistance, alloy hardness, alloy structure, alloy property age dependence, nickel alloy, Ni - Cr - W - Ti - Al alloy, chromium containing alloy, tungsten containing alloy, titanium containing alloy, aluminum containing alloy

ABSTRACT: This study attemps to determine the effect of long-term aging on the phase composition, structure, and alloy properties of a Ni - Cr - W - Ti - Al system. It is related to a general study of the various factors affecting the heat resistance of alloys. It has been successfully demonstrated that along with the test temperature, the time factor also exerts a great influence on this parameter. This paper deals with an investigation of the simultaneous effect of chemical composition, structure, and extended conversion time on the heat-resistance of certain alloys. The alloys consist of a five-component system, Ni - Cr - W - Ti -

Card 1/3

ACCESSION NR: AT4013944

Al, in which the content of Cr, W, and Ti is constant while the content of Al is varied between 0.5 and 7.9%. The compositions of the alloys studied correspond to the single-phase region of five-part solid solutions with a nickel base and the two-phase region with separations of the excess γ'-phase (based on an Ni_3Al compound). Prior to the investigation, the alloy samples in the cast state were subjected to temperatures of 1200C for 134 hours, and then tempered in water. This heat treatment resulted in a fixing of the tempered state of the supersaturated solid solutions and the heterogeneous structure of a series of alloys with excess phase. A study of the effect of extended aging times (to 25,000 hours) at 900C on the phase conversions of the alloys of the Ni - Cr - W - Ti - Al system showed that five-component solid solutions of alloys containing 1.8-5.1% Al undergo disintegration during the aging process. The number and dimensions of the excess phase particles increase as a function of the extended aging time period. The investigation of the effect of long conversion time on alloy hardness for the same system led to the discovery that the greatest changes in hardness are observed during the first tens and hundreds of hours of crystallochemical reactions in the course of the aging process at 900C. In analyzing the effect of the time factor (at the same temperature--900C) on the heat resistance of the alloys of the Ni - Cr - W - Ti - Al system, the authors concluded that there was a difference in the effect of the crystallochemical reaction time on alloy heat resistance under the conditions of a short-term and long-term creep tests. Under the conditions of the

Card 2/3

ACCESSION NR: AT4013944

short-term test (up to 300-400 hours), the most heat resistant was found to be the alloy with the maximum supersaturation of solid solution (with 5.1% Al). In the extended tests, alloys with a lesser degree of supersaturation (with 3.4, 2.8 and 1.8%Al) become the most heat resistant. A double influence was established for the excess phase on the heat resistance of the alloys. The initial stage of the fine-dispersion disintegration of the supersaturated solid solution is characterized by a strengthening of the alloy and an increase in heat resistance. As the excess phase coagulates, softening of the alloy and a reduction of heat resistance occur. Orig. art. has: 4 figures.

ASSOCIATION: Institut metallurgii AN SSSR (Institute of Metallurgy AN SSSR)

SUBMITTED: 00 DATE ACQ: 27Feb64 ENCL: 00

SUB CODE: ML NO REF SOV: 006 OTHER: 000

Card 3/3

ACCESSION NR: AT4007041 S/2598/63/000/010/0202/0206

AUTHOR: Kornilov, I. I.; Nartova, T. T.

TITLE: Investigation of the heat resistance of titanium aluminum tin alloys by the centrifugal method

SOURCE: AN SSSR. Institut metallurgii. Titan i yego splavy*, no. 10, 1963. Issledovaniya titanovy*kh splavov, 202-206

TOPIC TAGS: titanium aluminum tin system, titanium aluminum tin alloy, titanium alloy heat resistance, titanium alloy creep, Kornilov creep test, heat resistance, creep strength

ABSTRACT: In order to evaluate the creep strength of Ti-Al-Sn alloys in relation to temperature, composition and phase structure, the authors investigated the heat resistance of various cross sections of this system by the centrifugal bending method. Alloys were prepared in an arc furnace, annealed at 850C for 30 minutes and then subjected to stresses of 15-25 kg/mm^2 at temperatures of 500-800C for up to 400 hours. A study of the radial cross section in which Al:Sn = 1:1 showed maximal heat resistance in a mixture containing 30 wt. % Al + Sn, near the transition point from a solid solution to a

Card 1/3

ACCESSION NR: AT4007041

heterogeneous alloy. The results of studies on other cross sections, some of which are shown in Fig. 1 of the Enclosure, indicate that the heat resistance increases markedly in the area of the metallide solid solution, being considerably higher than for solid solutions of the metals themselves. Alloys of the Ti_3Al-Ti_3Sn system, corresponding to a continuous solid solution of the metallides, were found to show a continuous range of heat resistance, with composition maxima related to the time of deformation. The maximal heat resistance in this system was shown by alloys based on a compound of Ti and Al. Orig. art. has: 3 figures.

ASSOCIATION: Institut metallurgii AN SSSR (Metallurgical Institute, AN SSSR)

SUBMITTED: 00 ENCL: 01

SUB CODE: MM NO REF SOV: 006 OTHER: 000

Card 2/3

ACCESSION NR: AT4007046 S/2598/63/000/010/0234/0244

AUTHOR: Kornilov, I.I.; Mikheyev, V.S.; Andreyev, O.N.; Mayboroda, P.S.

TITLE: Heat resistance of some titanium alloys at 450-700 C

SOURCE: AN SSSR. Institut metallurgii. Titan i yego splavy*, no. 10, 1963. Issledovaniya titanovy*kh splavov, 234-244

TOPIC TAGS: titanium alloy heat resistance, titanium alloy, OT-4 alloy, OT-4-2 alloy, AT-3 alloy, AT-4 alloy, AT-6 alloy, AT-8 alloy, AT-9-0 alloy, AT-10 alloy, AT-10-0 alloy, AT-12 alloy, Ti sub 3 Al base alloy, titanium aluminum alloy, titanium aluminum manganese alloy, titanium aluminum vanadium alloy, VT-5-1 alloy, VT-14 alloy

ABSTRACT: The heat resistance of the VT-1, VT-5-1, VT-14, OT-4-2, AT-3, AT-4, AT-6, and AT-8 alloys was tested by a simple centrifugal method to determine the creep limit under thermal loads. Tests were carried out under loads of 20 kg/mm^2 at temperatures up to 700 C; specifically, tests were conducted at 450 C for 5000 hours, at 500 C for 250 hours, at 550 C for 100 hours, at 600 C for 50 hours, and at 700 C for 500 hours. Isotherms for the tested conditions were plotted. It was concluded that the VT-1 and VT-14 alloys are not heat resistant at any of the temperatures. The highest heat resistance at 600-700 C was shown by the AT-10 and AT-12 alloys, which contain

Card 1/2

ACCESSION NR: AT4007046

7 or 8 alloying elements, and the ST-2 alloy, which contains Ti_3Al as a main component. The AT-3 and AT-4 alloys showed good heat resistance up to 500 C and the AT-6 alloy up to 550 C. The AT-8 alloy, containing Al, Cr, Fe, Si, and B on a base of α-titanium showed a greater heat resistance at higher temperatures (up to 600 C) than the OT-4 and OT-4-2 alloys containing Ti, Al, and Mn or Ti, Al, and V with an $\alpha+\beta$ structure and VT-6 or VT-5-1 alloys containing Ti, Al, and Sn. It was proved that the heat resistance is increased by alloying with many elements. The heat resistance of the alloys containing six alloying elements increased in the direction AT-3 → AT-4 → AT-6 → AT-8 as their aluminum content increased. This was explained by the increase in the temperature of the $\alpha \rightleftarrows \beta$ transformation and the strengthening of the α solid solution. Orig. art. has: 10 figures and 2 tables.

ASSOCIATION: Institut metallurgii AN SSSR (Metallurgical Institute, AN SSSR)

SUBMITTED: 00 DATE ACQ: 27Dec63 ENCL: 00

SUB CODE: ML NO REF SOV: 016 OTHER: 000

Card 2/2

KORNILOV, I.I.; SHINYAYEV, A.Ya.; ANDREYEV, O.N.

Activation energy of creep and the mechanism of plastic deformation of titanium alloys. Titan i ego splavy no.10:251-253 '63. (MIRA 17:1)

ACCESSION NR: AT4007053 S/2598/63/000/010/0300/0306

AUTHOR: Boriskina, N. G.; Kornilov, I. I.

TITLE: Mechanical properties of titanium-rich alloys of the Ti-Cr-Fe system (sections with 0.5 and 1.5 % Fe)

SOURCE: AN SSSR. Institut metallurgii. Titan i yego splavy*, no. 10, 1963. Issledovaniya titanovy*kh splavov, 300-306

TOPIC TAGS: titanium chromium iron alloy, titanium alloy, titanium alloy structure, titanium alloy strength, titanium alloy ductility, titanium alloy heat resistance, titanium alloy property, alpha beta titanium alloy

ABSTRACT: Titanium alloys can be strengthened by alloying and by suitable heat treatment. The authors therefore studied the influence of iron and chromium and of heat treatment on some physical properties of titanium-base ternary alloys. The alloys investigated were of the Ti-Fe-Cr type; specifically, sections with 0.5 and 1.5 % Fe containing 0, 0.5, 1.0, 2.0, 3.0, and 5.0 % Cr. Tensile strength and elongation at room temperature and heat resistance measured in terms of time for a certain creep strain under specified conditions (stress 15 kg/mm^2 at 450C) were determined, and thermal stability was studied. The following heat treatments were applied: quenching in water

Card 1/2

ACCESSION NR: AT4007053

from 1000C (Maintained for 5 hours) or 750 C (200 hours) and annealing at 400C for 200 hours. Thermal stability was investigated in samples water-quenched from 750C and aged at 450C in a vacuum for 1, 10, 25, 50, and 100 hours. Hardness testing and metallographic examination were applied for detecting phase transformations. It was found that the mechanical properties of both investigated alloy sections with 0.5 and 1.5% Fe can be altered by heat treatment. In addition, it was discovered that quenching from 750C is the most favorable of the heat treatments tried for getting optimum mechanical properties at both room temperature and 450C. Maximum tensile strength and elongation at room temperature and maximum heat resistance were obtained with a 1.5% Fe section containing 3 and 5% Cr. In thermal stability tests, the observed beta decomposition rates were very slow, Fe and Cr being beta stabilizers. Only a partial transformation of beta solid solution into eutectoid was observed after annealing at 550 and 450C over a total of 2000 hours. It was concluded that the investigated alloys are of relatively high stability. Orig. art. has: 6 figures.

ASSOCIATION: Institut metallurgii AN SSSR. (Metallurgical Institute AN SSSR)

SUBMITTED: 00 DATE ACQ: 27Dec63 ENCL: 00

SUB CODE: MM NO REF SOV: 005 OTHER: 001

Card 2/2

S/078/63/008/002/003/012
B101/B186

AUTHORS: Ko Chih-ming, Kornilov, I. I., Pylayeva, Ye. N.

TITLE: Investigation of the phase diagram of the system titanium-aluminium-molybdenum in the titanium-rich alloying regions

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 8, no. 2, 1963, 366 - 372

TEXT: The present study belongs to a series of investigations of the quaternary system Ti-Al-Mo-V. In order to obtain missing data the solidus isotherms of alloys of the system Ti-Al-Mo containing (% by weight) 55 - 95 Ti, 5 - 35 Al and 0.5 - 40 Mo were plotted. Using these and data relating to the microstructure and X-ray analysis, nine polythermal cross-sections and three isothermal cross-sections were plotted. Results: Alloys rich in titanium melt at 1700°C. The m.p. rises to 2000°C with 50% Mo, whereas it falls to 1400°C with high aluminium content. Increasing molybdenum content causes the temperature of the $\alpha \rightleftharpoons \beta$ transitions to drop, increasing aluminium content raises it. With 5 to 10% Al content the polythermal cross-section passes through the crystallization regions of the β-, $(\alpha+\beta)$- and α-phases. With 15 to 20% Al content, the β-phase is the

Card 1/3

S/078/63/008/002/003/012
B101/B186

Investigation of the phase...

first to crystallize, which is then partially converted into the α-phase and finally the γ-phase separates itself from the α-phase. With 25% Al the $(\alpha+\beta+\gamma)$ region widens and a $(\beta+\gamma)$ region occurs. With 30% Al, the γ-phase is separated from the β-phase, which crystallizes first, and then the α-phase is formed due to peritectic transition. With 35% Al the β-phase crystallizes first and is followed by the γ-phase, so that a $(\beta+\gamma)$ region is formed. With 40% Al only the γ-phase forms from the melt. In the isothermal cross-section at 1100°C the largest region is the one of the β-phase reaching up to 10% Al. The α-phase, forming a narrow strip is adjacent to the Ti-Al side between 10 and 25% Al. The TiAl-based ternary solid solution, the γ-phase, has only a small region. The maximum solubility of Mo in TiAl is about 11 - 12% at 1100°C. Titanium alloys with less than 12% Al + Mo show martensitic structure after quenching in water. At 800°C the β-region becomes smaller and its boundary is displaced towards the Ti - Mo side. The central part of the cross-section is formed by the $(\alpha+\beta)$-phase. At 600°C the $(\alpha+\beta)$ region and the $(\alpha+\beta+\gamma)$ region widen. At this temperature the solubility of molybdenum in the solid α solution is about 1.0%. Between 600 and 1100°C the following phases are in equilibrium with one another: α, β, γ, $\alpha+\beta$, $\alpha+\gamma$, $\beta+\gamma$, $\gamma+TiAl_3$, $\alpha+\beta+\gamma$ and others. There are 6 figures and 1 table. The English-language references are: H. D. Kessler, Armour

Card 2/3

Research Foundation, Report on Contract No AD 11-022 ORD to Watertown Arsenal, 1951; H. Margolin et al., New York Univ. Eng. Res. Div., Final Report in Watertown Arsenal Laboratory, 1954, on Contract No Da-030-069-ORD-208.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences USSR)

SUBMITTED: June 6, 1962

Card 3/3

L 10710-63 EWP(q)/EWT(m)/BDS--AFFTC/ASD--JD/JG
ACCESSION NR: AP3001649 S/0063/63/008/003/0305/0317 55

AUTHOR: Kornilov, I. I. (Doctor in chemical sciences); Polakova, R. S. (Candidate of technical sciences)

TITLE: New metallic materials for chemical machine construction

SOURCE: Vsesoyuznoye khimicheskoye obshchestvo. Zhurnal, v. 8, no. 3, 1963, 305-317

TOPIC TAGS: aluminum, manganese, chromium, tin, iron, copper, boron, zirconium, vanadium, molybdenum, niobium, chemical machine construction, strength of materials, oxidation-resistance

ABSTRACT: Authors describe different titanium alloys and their characteristics and their application as machine components in the chemical industries. The most important alloys used to give titanium the desired strength and corrosion-resistance are: aluminum, manganese, chromium, tin, iron, copper, boron, and others. The best solid solution can be obtained by adding such elements as zirconium, vanadium, molybdenum, and niobium. The laboratory IMET recommended a composition of Ti-Al-Cr-Fe-Si-B, with 2.5%-3% aluminum for such melts as the AT-3,

Card 1/3 2

L 10710-63
ACCESSION NR: AP3001649

AT-4, and AT-8. The authors determined that the alloys increase the strength to a much higher degree than that of titanium alone, and also increase the plasticity of the product. The oxidation-resistance is increased by adding beryllium, of 4%, or by adding 20-25% chromium at a temperature of 700-900C and up to 0.25% silicon. Zirconium is highly corrosion-resistant against mineral acids, as for example against concentrated HCl and HNO sub 3 and also against 50% conc. NaOH and H sub 2 SO sub 4 at temperature of 100C. But concentrated H sub 2 SO sub 4 and 75% H sub 3 PO sub 4 destroys zirconium and also the aqua regia and the hydrofluoric acid dissolves zirconium. The physico-mechanical properties of titanium and its chemical stability against active chemical acids, can be sufficiently increased by adding other elements as alloys. By alloying titanium with platinum or palladium one can increase its corrosion resistance against sulfuric and salt acid solutions. By alloying titanium with more than 20% molybdenum, the corrosion-resistance of titanium is greatly increased in contact with salt-sulfuric and phosphoric acids. The best results are obtained by adding 30% molybdenum. Orig. art. has: 9 figures and 4 tables.

ASSOCIATION: none

Card 2/2

KORNILOV I. I.

TITLE: Seminar on refractory metals, compounds, and alloys [Kiev, April 1963]

SOURCE: Atomnaya energiya, v. 15, no. 3, 1963, 266-267

I. I. Kornilov. The interaction between refractory compounds involving the formation of binary, ternary, and multicomponent solid solutions.

G. V. Samsonov. Classification of hydrides, nitrides, and other compounds of nonmetals with elements of the periodic table.

V. N. Yeremenko, Z. I. Tolmachev. The relationship between some properties and the electron structure of transition metals and their interstitial phases.

G. V. Samsonov. The nature of the catalytic properties of transition metals.

I. A. Kedrinskiy, A. I. Avgustinnik, Ye. A. Berkman. Experimental data on the catalytic activity of refractory metal electrodes in electrochemical reactions.

Card 2/11

L 15510-63 EWP(q)/EWT(m)/BDS AFFTC/ASD JXT(IJP)/JD/JG
ACCESSION NR: AP3004591 S/0126/63/016/001/0057/0060

AUTHOR: Kornilov, I. I.; Mikheyev, V. S.; Konstantinov, K. M. 60 59

TITLE: Investigation of resistivity of alloys of the Ti-Al system from room temperature to 1200C

SOURCE: Fizika metallov i metallovedeniye, v. 16, no. 1, 1963, 57-60

TOPIC TAGS: titanium aluminum alloy, titanium aluminum system, titanium aluminum alloy resistivity, resistivity temperature gradient

ABSTRACT: The resistivity of 11 Ti-Al alloys containing 0—17.5% Al was measured in the range from room temperature to 1200C. Alloys were melted from TG-00 titanium sponge and 99.9% pure Al, annealed at 900C for 100 hr, 800C for 200 hr, and 700C for 100 hr, and furnace-cooled. Test specimens approximately 30 x 5 x 2.5 mm were stress-relieved at 700--750C for 30 min in a vacuum of 10^{-4} mm Hg. The test results (see Fig. 1 of the Enclosure) show

Card 1/ 3

L 15510-63

ACCESSION NR: AP3004591

that Al increases resistivity. At 900—1100C, the temperature of α to β transformation, resistivity decreases sharply. The temperature gradient of resistivity decreases with increasing Al content, and for alloys with 7.5—17.5% Al it is close to zero. Unalloyed titanium shows a considerable change of resistivity, from 0.5 ohm mm^2/m at room temperature to 1.65 ohm mm^2/m at the temperature of $\alpha \rightleftarrows \beta$ transformation. The temperature gradient of the β-phase of unalloyed titanium at 910—1000C is 0.012 μohm cm/deg. The diagram of $\alpha \rightleftarrows \beta$ transformation for Al contents from zero to 17.5% plotted on the basis of resistivity measurements coincides in general with diagrams obtained by other methods. Orig. art. has: 2 figures.

ASSOCIATION: Institut metallurgii im. A. A. Baykova AN SSSR (Institute of Metallurgy, AN SSSR)

SUBMITTED: 090ct62 DATE ACQ: 27Aug63 ENCL: 01

SUB CODE: MA, ML NO REF SOV: 003 OTHER: 007

Card 2/3

KONOBEYEVSKIY, S.T.; KORNILOV, I.I.

Colloquy on the effect of physical metallurgy on technology. Vest. AN SSSR 33 no.3:122-123 M '63. (MIRA 16:3)

1. Chlen-korrespondent AN SSSR (for Konobeyevskiy).
(Physical metallurgy—Congresses)

S/020/63/148/003/036/037
B117/B186

AUTHORS: Kornilov, I. I., Nartova, T. T.

TITLE: Long-endurance fatigue strength of titanium alloys on the basis of the Ti_3Al compound at 800°C

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 148, no. 3, 1963, 644-646

TEXT: Mechanical properties and long-endurance fatigue strength of alloys in the Ti_3Al range were investigated. The alloys investigated were produced from pure materials and titanum sponge by arc melting with permanent electrode, and the specimens were annealed for 1 hr at 850°C. Changes in the relative heat-resistance of binary titanium-aluminum alloys (addition of 0-20% by weight Al) were investigated at 700°C by the centrifugal bending test method (20 kg/mm^2). Under the same test conditions, pure titanium and alloys on the basis of solid solutions of α-titanium showed no heat-resistance. Their strength increased with increasing Al content. Alloys of the Ti_3Al range showed a high creeping strength which was also confirmed by standard tensile tests. It was found that the fatigue strength of Ti_3Al can be increased by alloying it with

KORNILOV, I. I.

AID Nr. 995-10 21 June

$TiCr_2$-$NbCr_2$ SYSTEM (USSR)

Kornilov, I. I., K. I. Shakhova, P. B. Budberg, and N. A. Nedumov. IN: Akademiya nauk SSSR, Doklady, v. 149, no. 6, 21 Apr 1963, 1340-1342. S/020/63/149/006/017/027

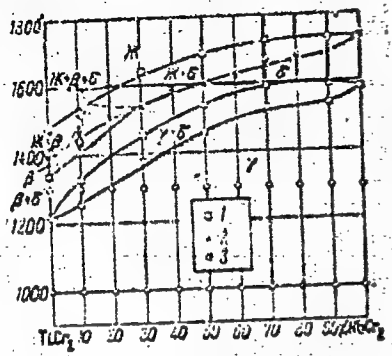
Ten $TiCr_2$-$NbCr_2$ alloys with 0 to 100% $TiCr_2$ have been studied at the Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR. From

Card 1/3

AID Nr. 995-10 21 June

S/020/63/149/006/017/027

TiCr2-NbCr2 SYSTEM [Cont'd]



1, 2 - contactless and optical thermal analysis; 3 - x-ray diffraction analysis (L = L)

the results of the thermal and x-ray diffraction analyses, the phase diagram (see illustration) of the system was plotted. Over the entire concentration range, $TiCr_2$ and $NbCr_2$ form a continuous series of solid solutions not only between the high-temperature modifications δ but also between the low-temperature modifications γ. The γ-δ transformation temperatures for $TiCr_2$ and $NbCr_2$ were determined as 1220 ± 10°C and 1585 ± 10°C, respectively. On the $TiCr_2$ side the β, β + δ, β + L, and β + δ + L regions are present, since the $TiCr_2$ compound in the binary Ti-Cr system is formed from a solid solution with a bcc lattice (the β-phase). X-ray diffraction patterns of alloys quenched from 1300°C showed that at this temperature the $TiCr_2$ compound is a hexagonal δ-phase; the 90%

Card 2/3

L 10090-63 EWP(q)/EWT(m)/BDS AFFTC/ASD JD
ACCESSION NR: AP3000518 S/0020/63/150/002/0313/0316

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AUTHOR: Kornilov, I. I.; Glazova, V. V.

TITLE: Formation of Ti sub 6 O and Ti sub 3 O compounds in the titanium-oxygen system

SOURCE: AN SSSR. Doklady, v. 150, no. 2, 1963, 313-316

TOPIC TAGS: titanium oxidation, titanium oxides, titanium-oxygen system

TEXT: An extensive study has been conducted of the Ti-O system, specifically of Ti-rich alloys with an O sub 2 content up to 35 at %. Alloys were melted in an unconsumable-electrode arc furnace in an argon atmosphere from 99.9% pure iodide Ti and a master alloy containing 15.8 wt % O sub 2, homogenized in vacuum at 1000C for 800 hrs, annealed at various temperatures in the 400-1400C range for periods of 600 to 2 hrs, and quenched in ice-cold water. Microscopic and x-ray diffraction analyses, microhardness tests, and measurements of electrical resistance and thermal emf all indicated the existence of two previously unknown oxides, Ti sub 6 O and Ti sub 3 O,

Card 1/2

KORNILOV, Ivan Ivanovich; AGEYEV, N.V., otv. red.; PRIKLONSKIY, A.A., red.

[Metallides and their interaction] Metallidy i vzaimodeistvie mezhdu nimi. Moskva, Nauka, 1964. 179 p. (MIRA 17:12)

1. Chlen-korrespondent AN SSSR (for Ageyev).

VUL'F, Boris Konstantinovich, KORNILOV, I.I., prof.dokt.khim.nauk, retsenzent; KOLOBNEV, I.F., doktor tekhn. nauk, retsenzent

[Ternary metal phases in alloys] Troinye metallicheskie fazy v splavakh. Moskva, Metallurgiia, 1964. 221 p. (MIRA 17:11)

BORISKINA, N.G., kand. tekhn. nauk; PYLAYEVA, Ye.N., kand. tekhn. nauk; KORNILOV, I.I., prof., doktor khim. nauk, otv. red.

[Metallography of titanium; transactions] Metallovedenie titana; trudy. Moskva, Nauka, 1964. 316 p. (MIRA 17:10)

1. Nauchnoye soveshchaniye po metallurgii, metallovedeniyu i primeneniyu titana i yego splavov. 5th, Moscow, 1963.

ACCESSION NR: AP4019815 S/0279/64/000/001/0143/0150

AUTHOR: Kornilov, I. I. (Moscow); Matveyeva, N. P. (Moscow)

TITLE: Relationships between the heat of dissociation and refractoriness of type MeNi sub 3 metallic compounds

SOURCE: AN SSSR. Izv. Metallurgiya i gornoye delo, no. 1, 1964, 143-150

TOPIC TAGS: intermetallic compound, Kurnakov compound, alloy heat resistance, nickel alloy heat resistance, dissociation heat, nickel alloy phase conversion, metallic nickel compound, MeNi sub 3

ABSTRACT: The relationship between the heat of dissociation in a solid solution (ΔH) for $MeNi_3$-type compounds and the position of the Fe, Mn, Cr, V, and Ti components in the periodic table was studied after 700, 1000, and 1400 hrs of hardening at 450 ($FeNi_3$, $MnNi_3$, $CrNi_3$) and 950C (VNi_3). An attempt was made to establish relationships between the changes in strength of chemical bonds (related to heat of reaction) and creep factors (25 kg/mm^2 at 450C), as well as the relative strength of alloys of similar chemical composition in a solid solution or compound state. The heat of dissociation for the so-called Kurnakov compounds ($FeNi_3$, $MnNi_3$, $CrNi_3$) reaches significant values, which approach those for VNi_3 and $TiNi_3$. The formation of these compounds, as well as VNi_3, from solid solutions represents a phase trans-

Card 1/2

Card 2/2

ACCESSION NR: AP4040993 S/0279/64/000/003/0169/0172

AUTHOR: Kornilov, I. I.(Moscow); Glazova, V. V. (Moscow)

TITLE: Oxidation resistance of oxygen-containing titanium

SOURCE: AN SSSR. Izvestiya. Metallurgiya i gornoye delo, no. 3, 1964, 169-172

TOPIC TAGS: titanium, titanium oxygen alloy, alloy oxidation resistance, alloy oxidation, titanium oxidation

ABSTRACT: Oxidation resistance of titanium-oxygen alloys with 1—35% oxygen was investigated. The alloys were melted under argon in an unconsumable electrode electric furnace from 99.9%-pure iodide titanium. The oxygen was added as a titanium-oxygen master alloy containing 15.8 wt% oxygen. Alloys were homogenized at 800C for 100 hr in a vacuum of 10^{-3}—10^{-4} mm Hg and quenched in ice water. The specimens were oxidized at 700—900C for 1—100 hr. At all temperatures tested, the pure titanium was found to be less resistant to oxidation than titanium alloys with 1, 3, and 5 wt% oxygen. The alloy with

Card 1/2

KORNILOV, I.I. (Moskva); MYASNIKOVA, K.P. (Moskva)

Constitutional diagram and certain physical properties of alloys in the system nickel - ruthenium. Izv. AN SSSR. Met. i gor. delo no.4:159-165 Jl-Ag '64. (MIRA 17:9)